



SEQUENCE LISTING

CALGENE LLC

<120> PLANT VDE GENES AND METHODS RELATED THERETO

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<140> 09075375

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<151> 1996-11-07

<150> PCTUS9618291

<151> 1996-11-07

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<151> 1996-08-06

<150> 60006315

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<170> PatentIn Ver. 2.0

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| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | |
| Tyr | Phe | Asn | Ser | Phe | Arg | Leu | Phe | Thr | Ser | Tyr | Lys | Thr | Ser | Ser | Phe |
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| | | | | | | | | | | | | | | | |
| Ser | Asp | Ser | Ser | His | Cys | Lys | Asp | Lys | Ser | Gln | Ile | Cys | Ser | Ile | Asp |
| 65 | | | | | 70 | | | | | 75 | | | | 80 | |
| | | | | | | | | | | | | | | | |
| Thr | Ser | Phe | Glu | Glu | Ile | Gln | Arg | Phe | Asp | Leu | Lys | Arg | Gly | Met | Thr |
| | | | | 85 | | | | 90 | | | | | | 95 | |
| | | | | | | | | | | | | | | | |
| Leu | Ile | Leu | Glu | Lys | Gln | Trp | Arg | Gln | Phe | Ile | Gln | Leu | Ala | Ile | Val |
| | | 100 | | | | | 105 | | | | | 110 | | | |
| | | | | | | | | | | | | | | | |
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|---|---------------------|---------------------|
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| Lys Cys Ile Ala Asn Pro Ser Cys Ala Ala Asn Val Ala Cys Leu Gln | | |
| 145 | 150 | 155 160 |
| Thr Cys Asn Asn Arg Pro Asp Glu Thr Glu Cys Gln Ile Lys Cys Gly | | |
| | 165 | 170 175 |
| Asp Leu Phe Glu Asn Ser Val Val Asp Gln Phe Asn Glu Cys Ala Val | | |
| | 180 | 185 190 |
| Ser Arg Lys Lys Cys Val Pro Arg Lys Ser Asp Val Gly Glu Phe Pro | | |
| | 195 | 200 205 |
| Val Pro Asp Arg Asn Ala Val Val Gln Asn Phe Asn Met Lys Asp Phe | | |
| | 210 | 215 220 |
| Ser Gly Lys Trp Tyr Ile Thr Ser Gly Leu Asn Pro Thr Phe Asp Ala | | |
| 225 | 230 | 235 240 |
| Phe Asp Cys Gln Leu His Glu Phe His Met Glu Asn Asp Lys Leu Val | | |
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| Gly Asn Leu Thr Trp Arg Ile Lys Thr Leu Asp Gly Gly Phe Phe Thr | | |
| | 260 | 265 270 |
| Arg Ser Ala Val Gln Thr Phe Val Gln Asp Pro Asp Leu Pro Gly Ala | | |
| | 275 | 280 285 |
| Leu Tyr Asn His Asp Asn Glu Phe Leu His Tyr Gln Asp Asp Trp Tyr | | |
| | 290 | 295 300 |
| Ile Leu Ser Ser Gln Ile Glu Asn Lys Pro Asp Asp Tyr Ile Phe Val | | |
| 305 | 310 | 315 320 |
| Tyr Tyr Arg Gly Arg Asn Asp Ala Trp Asp Gly Tyr Gly Gly Ser Val | | |
| | 325 | 330 335 |
| Ile Tyr Thr Arg Ser Pro Thr Leu Pro Glu Ser Ile Ile Pro Asn Leu | | |
| | 340 | 345 350 |
| Gln Lys Ala Ala Lys Ser Val Gly Arg Asp Phe Asn Asn Phe Ile Thr | | |
| | 355 | 360 365 |
| Thr Asp Asn Ser Cys Gly Pro Glu Pro Pro Leu Val Glu Arg Leu Glu | | |

| | | |
|---|-----|---------|
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| Lys Thr Ala Glu Glu Gly Glu Lys Leu Leu Ile Lys Glu Ala Val Glu | | |
| 385 | 390 | 395 400 |
| Ile Glu Glu Glu Val Glu Lys Glu Val Glu Lys Val Arg Asp Thr Glu | | |
| 405 | 410 | 415 |
| Met Thr Leu Phe Gln Arg Leu Leu Glu Gly Phe Lys Glu Leu Gln Gln | | |
| 420 | 425 | 430 |
| Asp Glu Glu Asn Phe Val Arg Glu Leu Ser Lys Glu Glu Lys Glu Ile | | |
| 435 | 440 | 445 |
| Leu Asn Glu Leu Gln Met Glu Ala Thr Glu Val Glu Lys Leu Phe Gly | | |
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| Arg Ala Leu Pro Ile Arg Lys Leu Arg Met Ala Leu Ala Pro His Ser | | |
| 465 | 470 | 475 480 |
| Asn Phe Leu Ala Asn His Glu Thr Ile Lys Tyr Tyr Val Gly Ser Lys | | |
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| Leu Pro Gly His Lys Arg Phe Ser Trp Gly Trp Glu Asp Tyr Phe Gly | | |
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| Ser Ile Val Val Ala Lys Ile Cys Ser Ser Arg Arg Ile Pro Arg Tyr | | |
| 515 | 520 | 525 |
| Phe Arg Lys Ser Pro Arg Ile Cys Cys Gly Leu Asp Ser Arg Gly Leu | | |
| 530 | 535 | 540 |
| Gln Leu Phe Ser His Gly Lys His Asn Leu Ser Pro Ala His Ser Ile | | |
| 545 | 550 | 555 560 |
| Asn Gln Asn Val Pro Lys Gly Asn Ser Gly Cys Lys Phe Pro Lys Asp | | |
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| Val Ala Leu Met Val Trp Glu Lys Trp Gly Gln Phe Ala Lys Thr Ala | | |
| 580 | 585 | 590 |
| Ile Val Ala Ile Phe Ile Leu Ser Val Ala Ser Lys Ala Asp Ala Val | | |
| 595 | 600 | 605 |
| Asp Ala Leu Lys Thr Cys Thr Cys Leu Leu Lys Glu Cys Arg Leu Glu | | |
| 610 | 615 | 620 |
| Leu Ala Lys Cys Ile Ser Asn Pro Ala Cys Ala Ala Asn Val Ala Cys | | |

| | | | |
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| Leu Gln Thr Cys Asn Asn Arg Pro Asp Glu Thr Glu Cys Gln Ile Lys | | | |
| 645 | 650 | 655 | |
| Cys Gly Asp Leu Phe Glu Asn Ser Val Val Asp Glu Phe Asn Glu Cys | | | |
| 660 | 665 | 670 | |
| Ala Val Ser Arg Lys Lys Cys Val Pro Arg Lys Ser Asp Val Gly Asp | | | |
| 675 | 680 | 685 | |
| Phe Pro Val Pro Asp Pro Ser Val Leu Val Gln Lys Phe Asp Met Lys | | | |
| 690 | 695 | 700 | |
| Asp Phe Ser Gly Lys Trp Phe Ile Thr Arg Gly Leu Asn Pro Thr Phe | | | |
| 705 | 710 | 715 | 720 |
| Asp Ala Phe Asp Cys Gln Leu His Glu Phe His Thr Glu Glu Asn Lys | | | |
| 725 | 730 | 735 | |
| Leu Val Gly Asn Leu Ser Trp Arg Ile Arg Thr Pro Asp Gly Gly Phe | | | |
| 740 | 745 | 750 | |
| Phe Thr Arg Ser Ala Val Gln Lys Phe Val Gln Asp Pro Lys Tyr Pro | | | |
| 755 | 760 | 765 | |
| Gly Ile Leu Tyr Asn His Asp Asn Glu Tyr Leu Leu Tyr Gln Asp Asp | | | |
| 770 | 775 | 780 | |
| Trp Tyr Ile Leu Ser Ser Lys Val Glu Asn Ser Pro Glu Asp Tyr Ile | | | |
| 785 | 790 | 795 | 800 |
| Phe Val Tyr Tyr Lys Gly Arg Asn Asp Ala Trp Asp Gly Tyr Gly Gly | | | |
| 805 | 810 | 815 | |
| Ser Val Leu Tyr Thr Arg Ser Ala Val Leu Pro Glu Ser Ile Ile Pro | | | |
| 820 | 825 | 830 | |
| Glu Leu Gln Thr Ala Ala Gln Lys Val Gly Arg Asp Phe Asn Thr Phe | | | |
| 835 | 840 | 845 | |
| Ile Lys Thr Asp Asn Thr Cys Gly Pro Glu Pro Pro Leu Val Glu Arg | | | |
| 850 | 855 | 860 | |
| Leu Glu Lys Lys Val Glu Glu Gly Glu Arg Thr Ile Ile Lys Glu Val | | | |
| 865 | 870 | 875 | 880 |
| Glu Glu Ile Glu Glu Glu Val Glu Lys Val Arg Asp Lys Glu Val Thr | | | |

| | | |
|---|------|------|
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| 900 | 905 | 910 |
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| Gly Leu Lys Met Glu Ala Thr Glu Val Glu Lys Leu Phe Gly Arg Ala | | |
| 930 | 935 | 940 |
| Leu Pro Ile Arg Lys Leu Met Ala Val Ala Thr His Cys Phe Thr Ser | | |
| 945 | 950 | 955 |
| | | 960 |
| Pro Cys His Asp Arg Ile Arg Phe Phe Ser Ser Asp Asp Gly Ile Gly | | |
| 965 | 970 | 975 |
| Arg Leu Gly Ile Thr Arg Lys Arg Ile Asn Gly Thr Phe Leu Leu Lys | | |
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| 995 | 1000 | 1005 |
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| | | 1120 |
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| Pro Arg Lys Ser Asp Leu Gly Glu Phe Pro Ala Pro Asp Pro Ser Val | | |

| 1140 | 1145 | 1150 |
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| Thr Ser Gly Leu Asn Pro Thr Phe Asp Ala Phe Asp Cys Gln Leu His | | |
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| 1185 | 1190 | 1195 1200 |
| Arg Ile Lys Thr Leu Asp Ser Gly Phe Phe Thr Arg Ser Ala Val Gln | | |
| 1205 | 1210 | 1215 |
| Lys Phe Val Gln Asp Pro Asn Gln Pro Gly Val Leu Tyr Asn His Asp | | |
| 1220 | 1225 | 1230 |
| Asn Glu Tyr Leu His Tyr Gln Asp Asp Trp Tyr Ile Leu Ser Ser Lys | | |
| 1235 | 1240 | 1245 |
| Ile Glu Asn Lys Pro Glu Asp Tyr Ile Phe Val Tyr Tyr Arg Gly Arg | | |
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| Asn Asp Ala Trp Asp Gly Tyr Gly Gly Ala Val Val Tyr Thr Arg Ser | | |
| 1265 | 1270 | 1275 1280 |
| Ser Val Leu Pro Asn Ser Ile Ile Pro Glu Leu Glu Lys Ala Ala Lys | | |
| 1285 | 1290 | 1295 |
| Ser Ile Gly Arg Asp Phe Ser Thr Phe Ile Arg Thr Asp Asn Thr Cys | | |
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| Gly Pro Glu Pro Ala Leu Val Glu Arg Ile Glu Lys Thr Val Glu Glu | | |
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| Gly Glu Arg Ile Ile Val Lys Glu Val Glu Glu Ile Glu Glu Glu Val | | |
| 1330 | 1335 | 1340 |
| Glu Lys Glu Val Glu Lys Val Gly Arg Thr Glu Met Thr Leu Phe Gln | | |
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| Val Arg Glu Leu Ser Lys Glu Glu Met Glu Phe Leu Asp Glu Ile Lys | | |
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1400

1405

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1410

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| Asn | Leu | Tyr | Ala | Arg | Ser | Pro | Cys | Asn | Glu | Arg | Phe | His | Arg | Ser | Gly | 20 | 25 | 30 |
| Gln | Pro | Pro | Thr | Asn | Ile | Ile | Met | Met | Lys | Ile | Arg | Ser | Asn | Asn | Gly | 35 | 40 | 45 |
| Tyr | Phe | Asn | Ser | Phe | Arg | Leu | Phe | Thr | Ser | Tyr | Lys | Thr | Ser | Ser | Phe | 50 | 55 | 60 |
| Ser | Asp | Ser | Ser | His | Cys | Lys | Asp | Lys | Ser | Gln | Ile | Cys | Ser | Ile | Asp | 65 | 70 | 75 |
| Thr | Ser | Phe | Glu | Glu | Ile | Gln | Arg | Phe | Asp | Leu | Lys | Arg | Gly | Met | Thr | 85 | 90 | 95 |
| Leu | Ile | Leu | Glu | Lys | Gln | Trp | Arg | Gln | Phe | Ile | Gln | Leu | Ala | Ile | Val | 100 | 105 | 110 |
| Leu | Val | Cys | Thr | Phe | Val | Ile | Val | Pro | Arg | Val | Asp | Ala | Val | Asp | Ala | 115 | 120 | 125 |
| Leu | Lys | Thr | Cys | Ala | Cys | Leu | Leu | Lys | Glu | Cys | Arg | Ile | Glu | Leu | Ala | 130 | 135 | 140 |
| Lys | Cys | Ile | Ala | Asn | Pro | Ser | Cys | Ala | Ala | Asn | Val | Ala | Cys | Leu | Gln | 145 | 150 | 155 |
| Thr | Cys | Asn | Asn | Arg | Pro | Asp | Glu | Thr | Glu | Cys | Gln | Ile | Lys | Cys | Gly | 165 | 170 | 175 |
| Asp | Leu | Phe | Glu | Asn | Ser | Val | Val | Asp | Gln | Phe | Asn | Glu | Cys | Ala | Val | 180 | 185 | 190 |
| Ser | Arg | Lys | Lys | Cys | Val | Pro | Arg | Lys | Ser | Asp | Val | Gly | Glu | Phe | Pro | 195 | 200 | 205 |
| Val | Pro | Asp | Arg | Asn | Ala | Val | Val | Gln | Asn | Phe | Asn | Met | Lys | Asp | Phe | 210 | 215 | 220 |
| Ser | Gly | Lys | Trp | Tyr | Ile | Thr | Ser | Gly | Leu | Asn | Pro | Thr | Phe | Asp | Ala | 225 | 230 | 235 |
| Phe | Asp | Cys | Gln | Leu | His | Glu | Phe | His | Met | Glu | Asn | Asp | Lys | Leu | Val | 245 | 250 | 255 |
| Gly | Asn | Leu | Thr | Trp | Arg | Ile | Lys | Thr | Leu | Asp | Gly | Gly | Phe | Phe | Thr | 260 | 265 | 270 |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Ser | Ala | Val | Gln | Thr | Phe | Val | Gln | Asp | Pro | Asp | Leu | Pro | Gly | Ala | 275 | 280 | 285 | |
| Leu | Tyr | Asn | His | Asp | Asn | Glu | Phe | Leu | His | Tyr | Gln | Asp | Asp | Trp | Tyr | 290 | 295 | 300 | |
| Ile | Leu | Ser | Ser | Gln | Ile | Glu | Asn | Lys | Pro | Asp | Asp | Tyr | Ile | Phe | Val | 305 | 310 | 315 | 320 |
| Tyr | Tyr | Arg | Gly | Arg | Asn | Asp | Ala | Trp | Asp | Gly | Tyr | Gly | Gly | Ser | Val | 325 | 330 | 335 | |
| Ile | Tyr | Thr | Arg | Ser | Pro | Thr | Leu | Pro | Glu | Ser | Ile | Ile | Pro | Asn | Leu | 340 | 345 | 350 | |
| Gln | Lys | Ala | Ala | Lys | Ser | Val | Gly | Arg | Asp | Phe | Asn | Asn | Phe | Ile | Thr | 355 | 360 | 365 | |
| Thr | Asp | Asn | Ser | Cys | Gly | Pro | Glu | Pro | Pro | Leu | Val | Glu | Arg | Leu | Glu | 370 | 375 | 380 | |
| Lys | Thr | Ala | Glu | Glu | Gly | Glu | Lys | Leu | Leu | Ile | Lys | Glu | Ala | Val | Glu | 385 | 390 | 395 | 400 |
| Ile | Glu | Glu | Glu | Val | Glu | Lys | Glu | Val | Glu | Lys | Val | Arg | Asp | Thr | Glu | 405 | 410 | 415 | |
| Met | Thr | Leu | Phe | Gln | Arg | Leu | Leu | Glu | Gly | Phe | Lys | Glu | Leu | Gln | Gln | 420 | 425 | 430 | |
| Asp | Glu | Glu | Asn | Phe | Val | Arg | Glu | Leu | Ser | Lys | Glu | Glu | Lys | Glu | Ile | 435 | 440 | 445 | |
| Leu | Asn | Glu | Leu | Gln | Met | Glu | Ala | Thr | Glu | Val | Glu | Lys | Leu | Phe | Gly | 450 | 455 | 460 | |
| Arg | Ala | Leu | Pro | Ile | Arg | Lys | Leu | Arg | Met | Ala | Leu | Ala | Pro | His | Ser | 465 | 470 | 475 | 480 |
| Asn | Phe | Leu | Ala | Asn | His | Glu | Thr | Ile | Lys | Tyr | Tyr | Val | Gly | Ser | Lys | 485 | 490 | 495 | |
| Leu | Pro | Gly | His | Lys | Arg | Phe | Ser | Trp | Gly | Trp | Glu | Asp | Tyr | Phe | Gly | 500 | 505 | 510 | |
| Ser | Ile | Val | Val | Ala | Lys | Ile | Cys | Ser | Ser | Arg | Arg | Ile | Pro | Arg | Tyr | 515 | 520 | 525 | |

Phe Arg Lys Ser Pro Arg Ile Cys Cys Gly Leu Asp Ser Arg Gly Leu
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Gln Leu Phe Ser His Gly Lys His Asn Leu Ser Pro Ala His Ser Ile
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Asn Gln Asn Val Pro Lys Gly Asn Ser Gly Cys Lys Phe Pro Lys Asp
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Val Ala Leu Met Val Trp Glu Lys Trp Gly Gln Phe Ala Lys Thr Ala
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Ile Val Ala Ile Phe Ile Leu Ser Val Ala Ser Lys Ala Asp Ala Val
 595 600 605

Asp Ala Leu Lys Thr Cys Thr Cys Leu Leu Lys Glu Cys Arg Leu Glu
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Leu Ala Lys Cys Ile Ser Asn Pro Ala Cys Ala Ala Asn Val Ala Cys
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Leu Gln Thr Cys Asn Asn Arg Pro Asp Glu Thr Glu Cys Gln Ile Lys
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Cys Gly Asp Leu Phe Glu Asn Ser Val Val Asp Glu Phe Asn Glu Cys
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Ala Val Ser Arg Lys Lys Cys Val Pro Arg Lys Ser Asp Val Gly Asp
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Phe Pro Val Pro Asp Pro Ser Val Leu Val Gln Lys Phe Asp Met Lys
 690 695 700

Asp Phe Ser Gly Lys Trp Phe Ile Thr Arg Gly Leu Asn Pro Thr Phe
 705 710 715 720

Asp Ala Phe Asp Cys Gln Leu His Glu Phe His Thr Glu Glu Asn Lys
 725 730 735

Leu Val Gly Asn Leu Ser Trp Arg Ile Arg Thr Pro Asp Gly Gly Phe
 740 745 750

Phe Thr Arg Ser Ala Val Gln Lys Phe Val Gln Asp Pro Lys Tyr Pro
 755 760 765

Gly Ile Leu Tyr Asn His Asp Asn Glu Tyr Leu Leu Tyr Gln Asp Asp
 770 775 780

| | | | |
|---|------|------|------|
| Trp Tyr Ile Leu Ser Ser Lys Val Glu Asn Ser Pro Glu Asp Tyr Ile | | | |
| 785 | 790 | 795 | 800 |
| Phe Val Tyr Tyr Lys Gly Arg Asn Asp Ala Trp Asp Gly Tyr Gly Gly | | | |
| | 805 | 810 | 815 |
| Ser Val Leu Tyr Thr Arg Ser Ala Val Leu Pro Glu Ser Ile Ile Pro | | | |
| | 820 | 825 | 830 |
| Glu Leu Gln Thr Ala Ala Gln Lys Val Gly Arg Asp Phe Asn Thr Phe | | | |
| | 835 | 840 | 845 |
| Ile Lys Thr Asp Asn Thr Cys Gly Pro Glu Pro Pro Leu Val Glu Arg | | | |
| | 850 | 855 | 860 |
| Leu Glu Lys Lys Val Glu Glu Gly Glu Arg Thr Ile Ile Lys Glu Val | | | |
| | 865 | 870 | 875 |
| Glu Glu Ile Glu Glu Glu Val Glu Lys Val Arg Asp Lys Glu Val Thr | | | |
| | 885 | 890 | 895 |
| Leu Phe Ser Lys Leu Phe Glu Gly Phe Lys Glu Leu Gln Arg Asp Glu | | | |
| | 900 | 905 | 910 |
| Glu Asn Phe Leu Arg Glu Leu Ser Lys Glu Glu Met Asp Val Leu Asp | | | |
| | 915 | 920 | 925 |
| Gly Leu Lys Met Glu Ala Thr Glu Val Glu Lys Leu Phe Gly Arg Ala | | | |
| | 930 | 935 | 940 |
| Leu Pro Ile Arg Lys Leu Met Ala Val Ala Thr His Cys Phe Thr Ser | | | |
| | 945 | 950 | 955 |
| Pro Cys His Asp Arg Ile Arg Phe Phe Ser Ser Asp Asp Gly Ile Gly | | | |
| | 965 | 970 | 975 |
| Arg Leu Gly Ile Thr Arg Lys Arg Ile Asn Gly Thr Phe Leu Leu Lys | | | |
| | 980 | 985 | 990 |
| Ile Leu Pro Pro Ile Gln Ser Ala Asp Leu Arg Thr Thr Gly Gly Arg | | | |
| | 995 | 1000 | 1005 |
| Ser Ser Arg Pro Leu Ser Ala Phe Arg Ser Gly Phe Ser Lys Gly Ile | | | |
| | 1010 | 1015 | 1020 |
| Phe Asp Ile Val Pro Leu Pro Ser Lys Asn Glu Leu Lys Glu Leu Thr | | | |
| | 1025 | 1030 | 1035 |
| | | | 1040 |

| | | | |
|---|------|------|------|
| Ala Pro Leu Leu Leu Lys Leu Val Gly Val Leu Ala Cys Ala Phe Leu | 1045 | 1050 | 1055 |
| Ile Val Pro Ser Ala Asp Ala Val Asp Ala Leu Lys Thr Cys Ala Cys | 1060 | 1065 | 1070 |
| Leu Leu Lys Gly Cys Arg Ile Glu Leu Ala Lys Cys Ile Ala Asn Pro | 1075 | 1080 | 1085 |
| Ala Cys Ala Ala Asn Val Ala Cys Leu Gln Thr Cys Asn Asn Arg Pro | 1090 | 1095 | 1100 |
| Asp Glu Thr Glu Cys Gln Ile Lys Cys Gly Asp Leu Phe Glu Asn Ser | 1105 | 1110 | 1115 |
| Val Val Asp Glu Phe Asn Glu Cys Ala Val Ser Arg Lys Lys Cys Val | 1125 | 1130 | 1135 |
| Pro Arg Lys Ser Asp Leu Gly Glu Phe Pro Ala Pro Asp Pro Ser Val | 1140 | 1145 | 1150 |
| Leu Val Gln Asn Phe Asn Ile Ser Asp Phe Asn Gly Lys Trp Tyr Ile | 1155 | 1160 | 1165 |
| Thr Ser Gly Leu Asn Pro Thr Phe Asp Ala Phe Asp Cys Gln Leu His | 1170 | 1175 | 1180 |
| Glu Phe His Thr Glu Gly Asp Asn Lys Leu Val Gly Asn Ile Ser Trp | 1185 | 1190 | 1195 |
| Arg Ile Lys Thr Leu Asp Ser Gly Phe Phe Thr Arg Ser Ala Val Gln | 1205 | 1210 | 1215 |
| Lys Phe Val Gln Asp Pro Asn Gln Pro Gly Val Leu Tyr Asn His Asp | 1220 | 1225 | 1230 |
| Asn Glu Tyr Leu His Tyr Gln Asp Asp Trp Tyr Ile Leu Ser Ser Lys | 1235 | 1240 | 1245 |
| Ile Glu Asn Lys Pro Glu Asp Tyr Ile Phe Val Tyr Tyr Arg Gly Arg | 1250 | 1255 | 1260 |
| Asn Asp Ala Trp Asp Gly Tyr Gly Gly Ala Val Val Tyr Thr Arg Ser | 1265 | 1270 | 1275 |
| Ser Val Leu Pro Asn Ser Ile Ile Pro Glu Leu Glu Lys Ala Ala Lys | 1285 | 1290 | 1295 |

Ser Ile Gly Arg Asp Phe Ser Thr Phe Ile Arg Thr Asp Asn Thr Cys
 1300 1305 1310

Gly Pro Glu Pro Ala Leu Val Glu Arg Ile Glu Lys Thr Val Glu Glu
 1315 1320 1325

Gly Glu Arg Ile Ile Val Lys Glu Val Glu Glu Ile Glu Glu Glu Val
 1330 1335 1340

Glu Lys Glu Val Glu Lys Val Gly Arg Thr Glu Met Thr Leu Phe Gln
 1345 1350 1355 1360

Arg Leu Ala Glu Gly Phe Asn Glu Leu Lys Gln Asp Glu Glu Asn Phe
 1365 1370 1375

Val Arg Glu Leu Ser Lys Glu Glu Met Glu Phe Leu Asp Glu Ile Lys
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 gtaggcttgg cattacaaga aagaggatca atggcacttt cttgctcaag attttacctc 180
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 tgaaagagct gaccgctccg ctgttgctaa aactcgtggg tgttttagct tgcgcgttcc 360
 ttattgttcc atctgcagat gcagttgatg cacttaaaac ttgtgcatgc ttattgaagg 420
 gatgcaggat agaactcgca aagtgcattg ccaaccctgc ctgtgcagcc aatgtcgcgt 480
 gccttcagac ctgcaataac cgtccagatg aaaccgagtg ccagattaaa tgtggggatc 540
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Gln Pro Pro Thr Asn Ile Ile Met Met Lys Ile Arg Ser Asn Asn Gly
 35 40 45

Tyr Phe Asn Ser Phe Arg Leu Phe Thr Ser Tyr Lys Thr Ser Ser Phe
 50 55 60

Ser Asp Ser Ser His Cys Lys Asp Lys Ser Gln Ile Cys Ser Ile Asp
 65 70 75 80

Thr Ser Phe Glu Glu Ile Gln Arg Phe Asp Leu Lys Arg Gly Met Thr
 85 90 95

Leu Ile Leu Glu Lys Gln Trp Arg Gln Phe Ile Gln Leu Ala Ile Val
 100 105 110

Leu Val Cys Thr Phe Val Ile Val Pro Arg Val Asp Ala Val Asp Ala
 115 120 125

Leu Lys Thr Cys Ala Cys Leu Leu Lys Glu Cys Arg Ile Glu Leu Ala
 130 135 140

Lys Cys Ile Ala Asn Pro Ser Cys Ala Ala Asn Val Ala Cys Leu Gln
 145 150 155 160

Thr Cys Asn Asn Arg Pro Asp Glu Thr Glu Cys Gln Ile Lys Cys Gly

| | | |
|---|-----|---------|
| 165 | 170 | 175 |
| Asp Leu Phe Glu Asn Ser Val Val Asp Gln Phe Asn Glu Cys Ala Val | | |
| 180 | 185 | 190 |
| Ser Arg Lys Lys Cys Val Pro Arg Lys Ser Asp Val Gly Glu Phe Pro | | |
| 195 | 200 | 205 |
| Val Pro Asp Arg Asn Ala Val Val Gln Asn Phe Asn Met Lys Asp Phe | | |
| 210 | 215 | 220 |
| Ser Gly Lys Trp Tyr Ile Thr Ser Gly Leu Asn Pro Thr Phe Asp Ala | | |
| 225 | 230 | 235 240 |
| Phe Asp Cys Gln Leu His Glu Phe His Met Glu Asn Asp Lys Leu Val | | |
| 245 | 250 | 255 |
| Gly Asn Leu Thr Trp Arg Ile Lys Thr Leu Asp Gly Gly Phe Phe Thr | | |
| 260 | 265 | 270 |
| Arg Ser Ala Val Gln Thr Phe Val Gln Asp Pro Asp Leu Pro Gly Ala | | |
| 275 | 280 | 285 |
| Leu Tyr Asn His Asp Asn Glu Phe Leu His Tyr Gln Asp Asp Trp Tyr | | |
| 290 | 295 | 300 |
| Ile Leu Ser Ser Gln Ile Glu Asn Lys Pro Asp Asp Tyr Ile Phe Val | | |
| 305 | 310 | 315 320 |
| Tyr Tyr Arg Gly Arg Asn Asp Ala Trp Asp Gly Tyr Gly Gly Ser Val | | |
| 325 | 330 | 335 |
| Ile Tyr Thr Arg Ser Pro Thr Leu Pro Glu Ser Ile Ile Pro Asn Leu | | |
| 340 | 345 | 350 |
| Gln Lys Ala Ala Lys Ser Val Gly Arg Asp Phe Asn Asn Phe Ile Thr | | |
| 355 | 360 | 365 |
| Thr Asp Asn Ser Cys Gly Pro Glu Pro Pro Leu Val Glu Arg Leu Glu | | |
| 370 | 375 | 380 |
| Lys Thr Ala Glu Glu Gly Glu Lys Leu Leu Ile Lys Glu Ala Val Glu | | |
| 385 | 390 | 395 400 |
| Ile Glu Glu Glu Val Glu Lys Glu Val Glu Lys Val Arg Asp Thr Glu | | |
| 405 | 410 | 415 |
| Met Thr Leu Phe Gln Arg Leu Leu Glu Gly Phe Lys Glu Leu Gln Gln | | |

| | | |
|---|-----|---------|
| 420 | 425 | 430 |
| Asp Glu Glu Asn Phe Val Arg Glu Leu Ser Lys Glu Glu Lys Glu Ile | | |
| 435 | 440 | 445 |
| Leu Asn Glu Leu Gln Met Glu Ala Thr Glu Val Glu Lys Leu Phe Gly | | |
| 450 | 455 | 460 |
| Arg Ala Leu Pro Ile Arg Lys Leu Arg Met Ala Leu Ala Pro His Ser | | |
| 465 | 470 | 475 480 |
| Asn Phe Leu Ala Asn His Glu Thr Ile Lys Tyr Tyr Val Gly Ser Lys | | |
| 485 | 490 | 495 |
| Leu Pro Gly His Lys Arg Phe Ser Trp Gly Trp Glu Asp Tyr Phe Gly | | |
| 500 | 505 | 510 |
| Ser Ile Val Val Ala Lys Ile Cys Ser Ser Arg Arg Ile Pro Arg Tyr | | |
| 515 | 520 | 525 |
| Phe Arg Lys Ser Pro Arg Ile Cys Cys Gly Leu Asp Ser Arg Gly Leu | | |
| 530 | 535 | 540 |
| Gln Leu Phe Ser His Gly Lys His Asn Leu Ser Pro Ala His Ser Ile | | |
| 545 | 550 | 555 560 |
| Asn Gln Asn Val Pro Lys Gly Asn Ser Gly Cys Lys Phe Pro Lys Asp | | |
| 565 | 570 | 575 |
| Val Ala Leu Met Val Trp Glu Lys Trp Gly Gln Phe Ala Lys Thr Ala | | |
| 580 | 585 | 590 |
| Ile Val Ala Ile Phe Ile Leu Ser Val Ala Ser Lys Ala Asp Ala Val | | |
| 595 | 600 | 605 |
| Asp Ala Leu Lys Thr Cys Thr Cys Leu Leu Lys Glu Cys Arg Leu Glu | | |
| 610 | 615 | 620 |
| Leu Ala Lys Cys Ile Ser Asn Pro Ala Cys Ala Ala Asn Val Ala Cys | | |
| 625 | 630 | 635 640 |
| Leu Gln Thr Cys Asn Asn Arg Pro Asp Glu Thr Glu Cys Gln Ile Lys | | |
| 645 | 650 | 655 |
| Cys Gly Asp Leu Phe Glu Asn Ser Val Val Asp Glu Phe Asn Glu Cys | | |
| 660 | 665 | 670 |
| Ala Val Ser Arg Lys Lys Cys Val Pro Arg Lys Ser Asp Val Gly Asp | | |

| | | |
|---|-----|---------|
| 675 | 680 | 685 |
| Phe Pro Val Pro Asp Pro Ser Val Leu Val Gln Lys Phe Asp Met Lys | | |
| 690 | 695 | 700 |
| Asp Phe Ser Gly Lys Trp Phe Ile Thr Arg Gly Leu Asn Pro Thr Phe | | |
| 705 | 710 | 715 720 |
| Asp Ala Phe Asp Cys Gln Leu His Glu Phe His Thr Glu Glu Asn Lys | | |
| 725 | 730 | 735 |
| Leu Val Gly Asn Leu Ser Trp Arg Ile Arg Thr Pro Asp Gly Gly Phe | | |
| 740 | 745 | 750 |
| Phe Thr Arg Ser Ala Val Gln Lys Phe Val Gln Asp Pro Lys Tyr Pro | | |
| 755 | 760 | 765 |
| Gly Ile Leu Tyr Asn His Asp Asn Glu Tyr Leu Leu Tyr Gln Asp Asp | | |
| 770 | 775 | 780 |
| Trp Tyr Ile Leu Ser Ser Lys Val Glu Asn Ser Pro Glu Asp Tyr Ile | | |
| 785 | 790 | 795 800 |
| Phe Val Tyr Tyr Lys Gly Arg Asn Asp Ala Trp Asp Gly Tyr Gly Gly | | |
| 805 | 810 | 815 |
| Ser Val Leu Tyr Thr Arg Ser Ala Val Leu Pro Glu Ser Ile Ile Pro | | |
| 820 | 825 | 830 |
| Glu Leu Gln Thr Ala Ala Gln Lys Val Gly Arg Asp Phe Asn Thr Phe | | |
| 835 | 840 | 845 |
| Ile Lys Thr Asp Asn Thr Cys Gly Pro Glu Pro Pro Leu Val Glu Arg | | |
| 850 | 855 | 860 |
| Leu Glu Lys Lys Val Glu Glu Gly Glu Arg Thr Ile Ile Lys Glu Val | | |
| 865 | 870 | 875 880 |
| Glu Glu Ile Glu Glu Glu Val Glu Lys Val Arg Asp Lys Glu Val Thr | | |
| 885 | 890 | 895 |
| Leu Phe Ser Lys Leu Phe Glu Gly Phe Lys Glu Leu Gln Arg Asp Glu | | |
| 900 | 905 | 910 |
| Glu Asn Phe Leu Arg Glu Leu Ser Lys Glu Glu Met Asp Val Leu Asp | | |
| 915 | 920 | 925 |
| Gly Leu Lys Met Glu Ala Thr Glu Val Glu Lys Leu Phe Gly Arg Ala | | |

| | | |
|---|------|----------------|
| 930 | 935 | 940 |
| Leu Pro Ile Arg Lys Leu Met Ala Val Ala Thr His Cys Phe Thr Ser | | |
| 945 | 950 | 955 960 |
| Pro Cys His Asp Arg Ile Arg Phe Phe Ser Ser Asp Asp Gly Ile Gly | | |
| | 965 | 970 975 |
| Arg Leu Gly Ile Thr Arg Lys Arg Ile Asn Gly Thr Phe Leu Leu Lys | | |
| | 980 | 985 990 |
| Ile Leu Pro Pro Ile Gln Ser Ala Asp Leu Arg Thr Thr Gly Gly Arg | | |
| | 995 | 1000 1005 |
| Ser Ser Arg Pro Leu Ser Ala Phe Arg Ser Gly Phe Ser Lys Gly Ile | | |
| | 1010 | 1015 1020 |
| Phe Asp Ile Val Pro Leu Pro Ser Lys Asn Glu Leu Lys Glu Leu Thr | | |
| | 1025 | 1030 1035 1040 |
| Ala Pro Leu Leu Leu Lys Leu Val Gly Val Leu Ala Cys Ala Phe Leu | | |
| | 1045 | 1050 1055 |
| Ile Val Pro Ser Ala Asp Ala Val Asp Ala Leu Lys Thr Cys Ala Cys | | |
| | 1060 | 1065 1070 |
| Leu Leu Lys Gly Cys Arg Ile Glu Leu Ala Lys Cys Ile Ala Asn Pro | | |
| | 1075 | 1080 1085 |
| Ala Cys Ala Ala Asn Val Ala Cys Leu Gln Thr Cys Asn Asn Arg Pro | | |
| | 1090 | 1095 1100 |
| Asp Glu Thr Glu Cys Gln Ile Lys Cys Gly Asp Leu Phe Glu Asn Ser | | |
| | 1105 | 1110 1115 1120 |
| Val Val Asp Glu Phe Asn Glu Cys Ala Val Ser Arg Lys Lys Cys Val | | |
| | 1125 | 1130 1135 |
| Pro Arg Lys Ser Asp Leu Gly Glu Phe Pro Ala Pro Asp Pro Ser Val | | |
| | 1140 | 1145 1150 |
| Leu Val Gln Asn Phe Asn Ile Ser Asp Phe Asn Gly Lys Trp Tyr Ile | | |
| | 1155 | 1160 1165 |
| Thr Ser Gly Leu Asn Pro Thr Phe Asp Ala Phe Asp Cys Gln Leu His | | |
| | 1170 | 1175 1180 |
| Glu Phe His Thr Glu Gly Asp Asn Lys Leu Val Gly Asn Ile Ser Trp | | |

1185
 Arg Ile Lys Thr Leu Asp Ser Gly Phe Phe Thr Arg Ser Ala Val Gln
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 Lys Phe Val Gln Asp Pro Asn Gln Pro Gly Val Leu Tyr Asn His Asp
 1220 1225 1230
 Asn Glu Tyr Leu His Tyr Gln Asp Asp Trp Tyr Ile Leu Ser Ser Lys
 1235 1240 1245
 Ile Glu Asn Lys Pro Glu Asp Tyr Ile Phe Val Tyr Tyr Arg Gly Arg
 1250 1255 1260
 Asn Asp Ala Trp Asp Gly Tyr Gly Gly Ala Val Val Tyr Thr Arg Ser
 1265 1270 1275 1280
 Ser Val Leu Pro Asn Ser Ile Ile Pro Glu Leu Glu Lys Ala Ala Lys
 1285 1290 1295
 Ser Ile Gly Arg Asp Phe Ser Thr Phe Ile Arg Thr Asp Asn Thr Cys
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 Gly Pro Glu Pro Ala Leu Val Glu Arg Ile Glu Lys Thr Val Glu Glu
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 Gly Glu Arg Ile Ile Val Lys Glu Val Glu Glu Ile Glu Glu Glu Val
 1330 1335 1340
 Glu Lys Glu Val Glu Lys Val Gly Arg Thr Glu Met Thr Leu Phe Gln
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 Arg Leu Ala Glu Gly Phe Asn Glu Leu Lys Gln Asp Glu Glu Asn Phe
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 Val Arg Glu Leu Ser Lys Glu Glu Met Glu Phe Leu Asp Glu Ile Lys
 1380 1385 1390
 Met Glu Ala Ser Glu Val Glu Lys Leu Phe Gly Lys Ala Leu Pro Ile
 1395 1400 1405
 Arg Lys Val Arg
 1410